

project WEB

fall
2004

Connecting Projects WILD, WET and Learning Tree in New Hampshire

Have Your Students...Dig into Data

The advent of the No Child Left Behind initiative has many teachers scrambling for new ways to get their students involved in hands-on, inquiry-based learning opportunities. What better way to do this than to have students develop a research project and collect data related to it; or join forces with scientists and collect data for ongoing projects? The possibilities are limitless, and students' rewards are great. In addition, the availability of computers in most classrooms makes the storage, sharing and

comparison of data easier than ever.

Projects that monitor change can take on almost any size, shape or duration. You're limited only by your imagination and resources. Projects can include monitoring changes in a wildlife population in a specific

area over time; documenting numbers of plant species in an abandoned field undergoing succession; measuring colonial growth of bacteria on an agar in the classroom; or noting of the arrival or departure of different migratory species to an area each spring and fall.

Monitoring can be done on a daily, weekly, seasonal or yearly basis. The opportunity to make comparisons from year to year with succeeding classes can add an exciting element to a long-term project. This issue of Project WEB provides a host of ideas for getting your

"The chief aim of interpretation is not instruction, but provocation."
—Freeman Tilden

students involved in data collection or monitoring projects.



Student Data: Is It Good Enough?

*By Jennifer Bourgeault
GLOBE Land Cover
Research Associate*

Since the mid-1990s, Student-Scientist Partnerships (SSPs) have been on the increase. These partnerships have taken on many forms, from the international data collection efforts of the Global Learning and Observations to Benefit the Environment (GLOBE) Program (www.globe.gov) to efforts here in the U.S., such as collecting GPS measurements to monitor crust movements in Alaska

(<http://denali.gsfc.nasa.gov/>).

SSPs are available in every science, including Earth, environmental and physical science, as well as biology, physics, biochemistry, biotechnology and chemistry. They usually provide teachers with activities and curriculum components, including links to the standards, to incorporate into the school day. Most provide students with the opportunity to contribute to scientific research. But are the data collected by students good enough to conduct



PHOTO © N.H. FISH AND GAME DEPT.

Microscopes offer high school students a closer look to identify aquatic microorganisms.

real science?

Many scientists say they are. In fact, every scientist in the GLOBE Program is using GLOBE data to conduct

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PHOTO © N.H. PROJECT LEARNING TREE

Henniker Community School 4th grader aging a log at HHP, Inc., a state-of-the-art hardwood sawmill in Henniker.

his or her research. For example, soil and atmospheric scientists are using this data to create and run models, and the land cover data are used to assess the accuracy of maps created from satellite imagery. Through

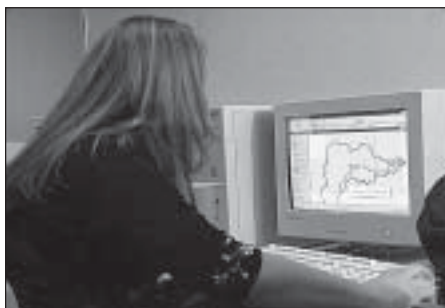


PHOTO © N.H. FISH AND GAME DEPT.

GIS data is used by high school students to study their watersheds.

initial studies, scientists found that student-collected data were not significantly different from data collected by experts and could be used to conduct some research. As a result, protocols have been created that students could follow and data scientists could use. (Congalton and Becker, 1997, Harnik and Ross, 2003).

Scientists are not after "data slaves" when creating SSPs. Instead, depending on the program, they offer students a chance to take part in actual research and then keep informed of their contributions. While participating, students not only have easy

... scientists found that student-collected data were not significantly different from data collected by experts.

access to scientists when questions arise, but are encouraged to create their own research projects and to incorporate the data they have collected. Just as the name suggests, there is a true partnership in SSPs that works to the benefit of all!

Congalton, R. and M. Becker. 1997. Validating Student Data for Scientific Use: An Example from the GLOBE Project. IN: Internet Links for Science Education: Student-Scientist Partnerships, Karen Cohen, (editor). Plenum Press, New York. 133-156.



PHOTO © N.H. PROJECT LEARNING TREE

Woodsville Elementary School kindergarteners study fir needles through a microscope.

Harnik, P. and R. Ross. 2003. Assessing Data Accuracy when Involving Students in Authentic Paleontological Research. Journal of Geoscience Education, v. 51, p. 76-84.



WEB Connections for this issue:

Great Bay Coast Watch
www.gbcw.unh.edu

**Upper Merrimack River
Local Advisory Committee**
www.merrimackriver.org/ummp.htm

**Connecticut River Watershed Youth/
Teacher Education**
<http://ceinfo.unh.edu/>

**New Hampshire Lakes
Lay Monitoring Program**
<http://cfb.unh.edu/>

**Volunteer Environmental
Monitoring Network**
www.merrimack.org/vemn/

Volunteer Lake Assessment Program
<http://des.nh.gov/WMB/VLAP/>

**Volunteer River Assessment
Program**
<http://des.nh.gov/WMB/VRAP/>

Weed Watchers
[www.des.state.nh.us/wmb/
exoticspecies/survey.htm](http://www.des.state.nh.us/wmb/exoticspecies/survey.htm)

Forest Watch
www.forestwatch.sr.unh.edu

GLOBE
[www.globe.gov/fsl/welcome/
welcomeobject.pl](http://www.globe.gov/fsl/welcome/welcomeobject.pl)

**Watershed Education Program
(High School)**
www.wildlife.state.nh.us/education

World Water Monitoring Day
www.worldwatermonitoringday.org

Farewell to Nicole and Hello to Jess



After seven years with the N.H. Department of Environmental Services (DES), working as an aquatic educator and serving as the state coordinator of



Nicole Clegg

Project WET, Nicole Clegg moved on in late August to pursue her long-time dream of teaching. As a science teacher at Epping High School, Nicole is truly in a position to practice what she has been preaching! Although she will be greatly missed, she won't be completely lost to us, as she will continue on as a Project WET and

WILD facilitator.

Nicole's colleague and Project WET assistant, Jessica Brock, an aquatic educator at DES, is the new state Project WET coordinator. We are very fortunate to have someone as capable as Jess to carry on the work of Project WET,



Jessica Brock

without missing a beat. Jess came directly to DES three years ago from St. Joseph College in Connecticut where she earned a degree in environmental science.



Spotlight on... the GLOBE Program

Linking Teachers with the Scientific World

By Jennifer Bourgeault
GLOBE Land Cover Research Associate

In each Project WEB issue, an individual or organization making a difference in New Hampshire is highlighted. For this issue on student data collection and monitoring programs, we highlight the GLOBE Program, making a difference in the state's schools by connecting teachers with the world through scientific investigations.

Have you ever wondered where your laundry detergent goes? Have you ever noticed that the forest you were walking in had small or very large trees? Have you ever considered how a worm survives in the soil? If you answered YES to any of these (or even NO), it's time to discover the answers for yourself.

Global Learning and Observations to Benefit the Environment, also known as the GLOBE Program, connects teachers with

involves activities that students are excited about.

With GLOBE, students take scientifically valid measurements in the field of atmosphere, hydrology, soils and land cover and enter their data into the GLOBE



PHOTO © N.H. DEPT. OF ENVIRONMENTAL SERVICE.

ABOVE: Teachers at 2004 NHEET Summer Institute identify soil type layers in a study pit with a U.S. Forest Service soil scientist.

LEFT: Hanover Street Middle School teachers learn to use plane-table mapping to study landcover.



PHOTO © N.H. FISH AND GAME DEPT.

everyone in between, the importance of the scientific method and the fun of outdoor data collection and indoor analysis, at the same time they learn more about their own communities. GLOBE is versatile – you can create small or large projects, alone or with other schools. Either way, you are helping scientists monitor our environment and helping your students learn the scientific method.

Still wondering where your laundry detergent goes? Or what types and size trees you have behind your school? Maybe you want to know more about soils, in case you don't see any worms... Visit www.globe.gov/ and get started on the path to discovery.

the world through scientific investigations. This approach to scientific, hands-on, interactive learning is unique. As a teacher, you have both the opportunity and the stress of finding programs to suit your students' academic needs. Science is a broad topic and often is most accessible when it

database (which is also accessible by non-GLOBE students, teachers and scientists). The data are then used by scientists across the world. Students also can visualize data with graphs and maps they have made themselves on the interactive website. The program teaches young and old, and

Students and Data Collection Make a

Students and Scientists Work Together to Determine Health of New England Forests

Forest Watch®, an environmental education activity program run by the University of New Hampshire, was designed to introduce both teachers and students to field, laboratory and satellite data analysis methods for assessing the health of local forest stands.

Participating students and classes are involved in meaningful scientific research, collecting and compiling data used by UNH researchers studying white pine health in New England.

White pine (*Pinus strobus*) is a known bio-indicator for tropospheric, or low-level, ozone damage.

Forest Watch combines modern technology with old-fashioned biology to

excite students and engage them in authentic science experiences. Integrated field, laboratory and image processing activities introduce students to the use of Earth-orbiting satellites as environmental monitoring tools. Forest Watch began in 1991 with six New Hampshire schools. Today, more than 250 teachers have been trained, representing approximately 200 organizations across New England, including more than 100 New Hampshire schools.

For more information on the Forest Watch Program, visit www.forestwatch.sr.unh.edu; or contact Mike Gagnon, Program Coordinator, Complex Systems Research Center, Morse Hall, University of New Hampshire, Durham, NH 03824; via e-mail at mgagnon@garnet.sr.unh.edu or by phone at (603) 862-1792.



High School Students Dive into Data Collection

One philosophy of the Science Department staff at Hopkinton Middle/High School is to involve students in real research. For several years students in the GIS and Natural Resources Management class have monitored and documented animal movement through the use of track and sign; monitored and documented area vernal pools; and located Blanding's, wood, and spotted turtle habitat. One project, White Mountain pH Snow-pack Analysis, involves several science disciplines, including physics, chemistry, biology and GIS.

Each year, classes visit two Appalachian Mountain Club huts in the White Mountains, one in the eastern portion of the mountains and the other in the west. The visits take place on two weekends, for three days each. During the hike to the huts, students take a variety of samples at every 100-foot rise in elevation. The second day, students continue taking samples while hiking to a nearby high peak. The last day is spent packing and trekking back. Throughout the project, students are involved at all levels, including planning, data acquisition and analysis. From the very beginning, students plan all the work details, menus and equipment; they also create maps and a web site.

During the trip, students do all the work, including cooking, cleaning, reading samples, hut maintenance and problem solving. Once back at school, students enter the data into spreadsheets, do an error analysis and plot data on a 3-D map using ArcView. To date, three years of data have been collected at Carter Notch, one year at Lonesome Lake and one year at Zealand Falls. Over the years, students have passed on their successes and suggestions for improvements to upcoming students, thus creating a legacy for deeper analysis and further research.

— Scott Semmens, Science Teacher,
Hopkinton High School

Students Help Document Winter Deer Survival

Winter, Weather and White-tailed Deer is a wildlife management curriculum unit that provides middle school students with an opportunity to become involved in real-life management practices. By measuring daily temperatures and snow depths between December 1 and April 30, students gather crucial data used by N.H. Fish and Game Department biologists in determining the annual Winter Severity Index (WSI). The WSI is used by wildlife biologists and others to estimate the effects of cold, snowy winter conditions on New Hampshire's deer populations.

Winter severity is measured using a system that involves keeping track of the number of days when the minimum temperature is 0 degrees Fahrenheit or less and the number of days when the snow depth equals 18 inches or more. As deer are not able to meet their daily nutritional requirements during a New Hampshire winter, they must rely on stored fat for their survival. Whenever the temperatures are very cold and snow is deep, deer tap into



their fat reserves for the extra energy they need to keep warm and move about. The WSI gives biologists a good estimate of the number of deer that will survive the winter.

If you would like to involve your class in collecting data for the WSI, contact Mary Goodyear at mgoody@ncia.net or at 846-5108. Fish and Game provides participating teachers with a thermometer and a snow stake to install on their school grounds, as well as a copy of the related curriculum.

Great Match

Students Can Help Determine the Health of State's Rivers and Lakes

New Hampshire has an abundance of rivers and lakes, all of which provide great opportunities for teachers to get their students involved with river and lake assessment projects. The N.H. Department of Environmental Services (DES) is responsible for reporting to the Environmental Protection Agency (EPA) every two years on the condition of every lake and waterway in the state to ensure it meets state and federal standards and to follow the requirements identified by the Clean Water Act. As DES does not have the resources available to do all the monitoring itself, its staff recruits and trains volunteers to monitor the rivers and lakes in their areas.

Teachers are welcome to include their students in the monitoring process, but first must become trained in specific data collection standards or protocols to ensure validity of the data collected. There are many aspects of monitoring in which students can get involved. Teachers may choose to have their classes monitor a river or lake for the presence of exotic aquatic plant such as milfoil, the extent of bank



Stream Surveys Provide Hands-on Learning

Newmarket Elementary School students survey a stream on their school property, collecting a range of data, from aquatic organisms to water chemistry.



PHOTOS © N.H. FISH AND GAME DEPT.

erosion, the species and numbers of insects present, or to perform chemical water tests.

For further information or to get involved in the Volunteer River Assessment Program call 271-2457; or e-mail: vrmap@des.state.nh.us For information or to

get involved in the Volunteer Lakes Assessment Program call 271-2658 or e-mail: vlap@des.state.nh.us

For information about both programs visit <http://des.nh.gov/wmb>.



Activities Related to Articles in This Issue

Project WILD suggests:

In the activity *World Travelers*, students conduct field research to determine exotic species in an area, develop graphs and maps that depict the proportions of the exotic species; then write a report on their effects on native populations. Establishment of long-term control plots and annual visits to the same area enable monitoring of exotics over time.

By participating in *Bird Song Survey*, students have the opportunity to contribute to the knowledge about bird populations in their area through learning bird count techniques and participating in an annual survey.

Students estimate population density of deer in a given area by counting deer pellet groups in the activity, *Dropping in on Deer*. Surveys of the same area over

several years enable students to monitor population trends.

Project WET suggests:

In *Macroinvertebrate Mayhem*, students play a game of tag to simulate the effects of environmental stressors on macroinvertebrate populations. By doing so, they illustrate how aquatic organisms can be used to monitor water quality.

Students make observations on how ground water transports pollutants, and simulate ground water testing to discover the source of contamination in the *Pucker Effect*.

Do you and your students want to participate in solving a mystery? Here's your chance. In *A Grave Mistake*, students analyze data to solve who is the potential polluter in town.

Project Learning Tree suggests:

Like humans, trees can become weak and unhealthy, suffer injury and die. To help them, people have learned to read the symptoms of unhealthy trees. In *Trees in Trouble*, students will examine trees for signs of damage or poor health.

In *Waste Watchers*, students take a look at how they use energy in their own homes and how they can reduce the amount of energy they waste.



A plant is a biological system with these basic requirements for functioning and growing: sunlight, water, air, soil and space. *How Plants Grow* allows students to explore what happens when a plant's basic needs are not met.

ANNOUNCEMENTS

NH Project Learning Tree's 25th Anniversary

2004 marks the 25th anniversary of NH Project Learning Tree. Keep your eyes open for news of special events and celebrations occurring throughout the state. For more information, contact Beth Lesure at 226-0160 or info@nhplt.org.

New NH Project Learning Tree Website Up and Running

Visit www.nhplt.org for a new perspective on NH Project Learning Tree (NHPLT). The new site contains information about upcoming events, downloadable educational supplements, links to partnering organizations and information on outstanding educators, special initiatives and NHPLT supporters.

Exploring Environmental Issues: Focus on New Hampshire Forests

NH Project Learning Tree recently published a set of fact sheets designed to introduce middle and high school students to current environmental issues in New Hampshire. These sheets, entitled *Tough Choices for Outdoor Recreation in the Granite State*, *Pesticide Use in New Hampshire* and *New Hampshire's Changing Landscape*, are available by calling Beth Lesure at 226-0160 or emailing info@nhplt.org.

The Global Schoolhouse

Begun in 1992, *The Global Schoolhouse* is a Global Schoolnet international online community education project where students can find online collaborative projects organized by topic and grade level. Visit www.gsh.org/GSH/index.html.

Wild Website for Kids

Visit www.wildnewengland.org, a lively kids' website hosted by New Hampshire Fish and Game and the Maine Department of Inland Fisheries and Wildlife, with information on wildlife and ecological concepts presented in a kid-friendly format. Every issue has wildlife features kids can relate to, plus fun stuff to do and "lynx" to other sites. Content changes every two months.



Granite State Distance Learning Network

Explore a variety of wildlife-related topics through a series of workshops co-sponsored by N.H. Fish and Game and N.H. Public Television (NHPTV). The workshops, designed for K-12 educators, are made available through the Granite State Distance Learning Network. Participants can join in from 4:00 – 5:30 p.m. on the third Thursday of each month of the school year, except December and June, at a variety of sites throughout the state. This year's topics include forest insect pests, moose, bald eagle recovery, amphibians and reptiles and New Hampshire fish and their habitats. For more information and to register, visit www.nhptv.org/kn/wildnh/.



New Season of Wildlife Journal TV

Tune in on Thursday nights at 9 p.m. on New Hampshire Public Television.

Wildlife Journal is a co-production of Fish and Game and NHPTV. Visit www.wildlifejournal.tv.

Earth as a System for Educators

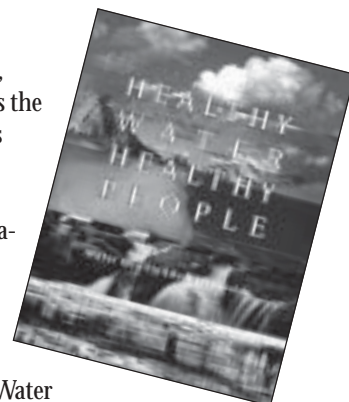
Spring 2005 Semester
Wednesdays 6-8 p.m.
Saturday a.m. Lab Classes
4 Credit Hours, UNH-Durham

Are you looking for a course to help you with your highly qualified teacher status? This course is specifically designed with you the educator in mind, providing you with solid content and hands-on, integrated activities for your classroom. It will explore the concept of the Earth as a System. Topics will include ecosystems, habitats, biomes, biodiversity, weather, climate, water and air quality, watersheds, remote sensing, the flow of matter and energy through the universe, water and nutrient cycles, wildlife identification and monitoring, wetlands, seasons, interdependence, and finally, changes over time. The course will focus on content being taught through Project WILD, WET, Learning Tree and Project HOME activities. The GLOBE protocols are an integral part of all the lab exercises. They will provide an opportunity to learn science methods and content through the use of classroom friendly techniques that can be used to integrate into units for elementary and middle school students. As the semester progresses, learners will use the scientific method to answer questions they have generated about their study site and use specific measurements and data analysis that will help to answer their questions.

For information on how to register, contact Jennifer Bourgeault at 862-4178 or jen.bourgeault@unh.edu.

Healthy Water Healthy People

This Educators Guide and Testing Kit Manual, designed for sixth grade to the university level, raises the awareness and understanding of water quality topics and issues. The guide contains 25 activities linking priority water quality topics to real-life experiences. While the testing kit manual yields in-depth information about 11 water quality parameters, it also answers questions about water quality testing using technical overviews, data interpretation guidelines, case studies, chemical formulas, testing kit activities, laboratory demonstrations and more. The Healthy Water Healthy People materials are available at www.healthypeople.org.



ON THE H.O.M.E. FRONT

Knowing Place: In-depth Study of a Small Patch of Ground

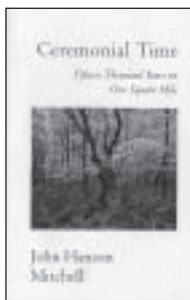
BY MARILYN WYZGA

Imagine exploring the layers of history in one small area – reaching back into the Paleolithic era to unearth the geology, walking with early wildlife inhabitants and human settlers, discovering remnants of past plant communities and pondering their implications for the future landscape – in short, intimately *knowing* a piece of land. Two author's explorations, one published in 1984 and the other in 1789, offer springboards for inspiring such focused, long-term study of the land around your school.

Meet Scratch Flat

The first of these books is *Ceremonial Time* by John Hanson Mitchell, which begins:

"There is a plum grove just above the house in which I live, a tangled, unproductive group of some twelve trees that were planted sometime in the late 1920s by an old curmudgeon who lived in the house in the decades following the turn of the century. Every morning between April and November, weather permitting, I take a pot of coffee up to that grove to watch the sun come up over the lower fields and to think about things... I have come in recent years to accept the primitive concept of ceremonial time, in which past, present and future can all be perceived in a single moment, generally during some dance or sacred



ritual... it is a convenient method of understanding the changes that have taken place on this particular patch of earth over the last fifteen thousand years."

This launches his scrutiny of "Scratch Flat," one square mile of land west of Boston. Through conversation, stories, and research, Mitchell traces the life of Scratch Flat from the last ice age, through years of Indians, shamans, and bears, to the colonists, witches and farmers, and the encroaching industrial parks. He goes beyond "reading the landscape" of his town, and analyzes its history, anthropology, agriculture, geology, botany and zoology. Throughout, he is notably concerned with our tendency to seek "somewhere else" for wilderness and wildlife experiences. "What I prefer," he writes, "is that undiscovered country of the nearby, the secret world that lurks beyond the night windows and at the fringes of cultivated backyards."

Mitchell has also explored and written about his immediate surroundings in several other books, including *A Field Guide to Your Own Back Yard* and *Living at the End of Time*.

The Selborne Project

The second model is *The Natural History and Antiquities of Selborne* by Gilbert White, considered England's first ecologist. In 1756, White became curate in Selborne, Hampshire, his native parish (home town). His painstaking study of Selborne's fauna and flora was recounted in regular correspondence with two distinguished naturalists: Thomas Pennant and Daines Barrington. *The Natural History of Selborne* was published in 1789 in the form of his letters, and has delighted and inspired readers ever since.

In these letters, White tells of his observations of local wildlife and discusses ideas arising from those observations. He reveals many intriguing details about the



Taking time to notice can result in discovering a secret world right at one's feet.

PHOTO © N.H. FISH AND GAME DEPT.

English countryside and life in a local country community. The letters contain White's discoveries about local birds and animals, reflecting his preference to distinguish species by observation rather than by collecting specimens. White is still regarded by many as the archetype of the unassuming, patient, observant naturalist.

The Roger Tory Peterson Institute was inspired by White's work to create the *Selborne Project*, now known as *Teaming with Nature*. This program provides professional development for teachers to incorporate nature study into their existing curriculum, using the schoolyard as an open-air classroom. Students learn science, language arts, mathematics, and social studies as they investigate an area one square kilometer in size.

A Local Example

A New Hampshire resource is the Monadnock Institute for Nature, Place and Culture www.fpc.edu/monadnockinstitute/. In 1999, the institute won a grant for a collaborative project on land, history, and a sense of place at Keene High School, entitled "Home Ground." School faculty, institute staff and outside consultants have since mapped and researched the immediate area, tracing landscape clues and local records as far back as the eighteenth century.

In a time when life is moving at a rapid pace, these books provide an opportunity to slow down and focus. They also yield a wealth of information about how the passage of time writes change in a landscape, which is especially valuable to our understanding for future land use planning.



Schoolyard Data Collection

Some schools, while exploring schoolyard habitat, also participate in online data collection and monitoring projects. Through programs such as Monarch Watch www.monarchwatch.org/ (based at the



A 7th grade student monitors one of 100 nest boxes installed at the Kingswood Middle School in Wolfboro.

University of Kansas Entomology Program), they contribute to an international database on the migratory paths and success of the monarch butterfly. The Cornell Lab of Ornithology's Project Feederwatch birds.cornell.edu/pfw/ and Classroom FeederWatch birds.cornell.edu/cfw/ involve students in collecting data about bird activity around feeders. Journey North www.learner.org/jnorth/ engages K-12 students in a global study of wildlife migration and seasonal change. Participants share their own field observations with classmates across North America as they track the coming of spring through the migration patterns of monarch butterflies, bald eagles, robins, hummingbirds and other animals, as well as the budding of plants, changing sunlight and other natural events.



PHOTOS © N.H. FISH AND GAME DEPT.

Some students collect and share data on the migration of monarch butterflies.



Coordinator Information

Mary Goodyear Project WILD

N.H. Fish and Game Dept.
RR1, Box 241
Whitefield, NH 03598
(603) 846-5108
mgoody@ncia.net
www.wildlife.state.nh.us



Jessica Brock Project WET

N.H. Department of
Environmental Services
29 Hazen Drive
Concord, NH 03301
(603) 271-4071
wet@des.state.nh.us
www.des.state.nh.us/wet



Esther Cowles Project Learning Tree

54 Portsmouth Street
Concord, NH 03301
(800) 677-1499
info@nhplt.org
www.nhplt.org



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Fish & Game Department
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